

## Section 1-6: Quartiles and Percentiles

**By the end of this lesson, you should be able to answer:**

- How do you identify quartiles and calculate percentiles?
- How do you create a box-and-whisker plot?

**Where you might see this in the real world:**

- Education, market research, statistics

Define the following terms:

1. Quartiles
2. Interquartile range
3. Box-and-whisker plot
4. Whiskers
5. Outliers
6. Percentile

Use the following information to find the median of prices of bicycles sold at Cycle Garage (dollars).

360 239 159 278 300 384 109 255 195 375 215 229 240

Step 1: Arrange the numbers in order from smallest to largest. The median will be the number in the middle.

To find the quartiles, we need to find the median of the lower half of the information and the median of the upper half of the information. The median in the lower half will be the **first quartile**, and the upper median will be the **third quartile**. These values, along with the median of the entire data (**second quartile**) will group the data into four equal sections.

These three values will be used to make the box in our box-and-whisker plot. The left side will be the first quartile, the right side the third quartile, and the second quartile will be placed inside the box.

To determine how far our whiskers will extend, we need to examine the values outside the box and compare with the interquartile range (IQR). To find the IQR, we take  $Q3 - Q1$ . Any values that are 1.5 times the IQR higher than  $Q3$  or 1.5 times the IQR lower than  $Q1$  will be outliers.

Let's find the IQR for this set, and then see if any values end up being outliers.

IQR =

Lowest possible value =

Highest possible value =

Now let's create our box-and-whisker plot. Include a number line!

We can also graph this on a graphing calculator, using a **STAT PLOT**. We follow the same steps we would for a scatter plot and histogram, but choose the graph for a box-and-whisker instead. Make sure to choose the one that can graph outliers. Now let's take a look. Press the **GRAPH** button and you will see the box-and-whisker. Press the **TRACE** button and see what values are given as you trace left and right. Add 1000 to your list and then re-zoom the graph and you will see an outlier.

You will often see percentiles when dealing with SAT scores, as you will be given a number that tells you how well you did compared to everyone else who took the test that day. A percentile tells you the percent of the whole that scored at or below your score.

Example 1: Matt Mitarnowski is ranked 75<sup>th</sup> in his class of 200 students. Fuzzy Jeff is in the same class and has a percentile rank of 75. Who has the higher standing in the class?

Problem Set:

*"The highest result of education is tolerance." - Helen Keller*